

transmitter channel spectrums 1720A-1720C, 1720F-1720K,  
along with the outdoor FCC emission limitation 610  
according to some embodiments. The frequency spectrum 1700  
does not include the fourth and fifth channels with  
5 frequency range from 5.075 GHz to 6.375 GHz. By no  
transmitting the fourth and fifth channels, the  
interference between the outdoors handheld UWB  
communication devices and WLAN 802.11a lower and upper  
bands can be avoided. This is because the WLAN 802.11a  
10 lower and upper bands are in the frequency ranges from  
5.150 GHz to 5.350 GHz and from 5.725 GHz to 5.825 GHz,  
respectively. As a result, the interference can be avoided  
between the outdoor handheld UWB and WLAN 802.11a by no  
transmitting the fourth and fifth channels of multichannel  
15 filter-based outdoor handheld UWB communication device.

While the present inventions have been described with  
respect to a limited number of embodiments, those skilled  
in the art will appreciate numerous modifications and  
variations therefrom. It is intended that the appended  
20 claims cover all such modifications and variations as fall  
within the true spirit and scope of these present  
inventions.

What is claimed is:

1

1           1.    A multichannel filter of the outdoor handheld UWB  
2 communication transceiver comprising:  
3               a digital FIR lowpass-shaping filter; or  
4               a digital cascaded FIR filter including a digital  
5 multiband FIR lowpass-shaping filter and a digital FIR  
6 rejected lowpass filter generating an output ripple signal  
7 magnitude about 61.8 (dBm) less than the normalized gain at  
8 a frequency of 0.325 GHz.  
9  
10           2.   The multichannel filter of claim 1 wherein said  
11 digital FIR lowpass-shaping filter is only one single  
12 filter that may be reused to generate all of the  
13 multichannel signal with different multi-carrier  
14 frequencies.  
15  
16           3.   The multichannel filter of claim 1 wherein said  
17 digital cascaded FIR filter is only one single filter that  
18 may be reused to generate all of the multichannel signal  
19 with different multi-carrier frequencies.  
20  
21           4.   The multichannel filter of claim 1 wherein said  
22 digital FIR lowpass-shaping filter may be used to produce  
23 the scalability data rates with multi-carrier frequencies  
24 for the multichannel-based outdoor handheld UWB  
25 transceiver.  
26

27           5.    The multichannel filter of claim 1 wherein said  
28 digital cascaded FIR filter may be used to produce the  
29 scalability data rates with multi-carrier frequencies for  
30 the multichannel-based outdoor handheld UWB transceiver.  
31

32           6.    The multichannel filter of claim 1 wherein the  
33 outdoor handheld UWB transceiver may select either said  
34 digital FIR lowpass shaping filter or said digital cascaded  
35 FIR filter to produce the multichannel UWB signal with  
36 scalability data rates.  
37

38           7.    The multichannel filter of claim 1 wherein said  
39 digital FIR lowpass-shaping filter and said digital  
40 cascaded FIR filter is equivalently produce the same  
41 transmitter function to meet the outdoor transmitter  
42 spectrum mask.  
43

44           8.    A digital FIR lowpass-shaping filter for outdoor  
45 handheld UWB transmitter comprising:

46               a lowpass band 0 - 0.26 (GHz);  
47               a first transition band 0.26 - 0.325 (GHz);  
48               a second transition band 0.325 - 0.39 (GHz);  
49               a third transition band 0.39 - 0.45 (GHz); and  
50               a stop band 0.45 - 0.5 (GHz).  
51  
52

53           9.    The digital FIR lowpass-shaping filter of claim 8  
54    wherein said digital FIR lowpass-shaping filter is only one  
55    filter that may be needed in the use for the entire  
56    multichannel.

57

58           10.   The digital FIR lowpass-shaping filter of claim 8  
59    wherein said digital FIR lowpass-shaping filter may have  
60    83-filter taps with odd symmetric and linear phase.

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62           11.   The digital FIR lowpass-shaping filter of claim 8  
63    wherein said digital FIR lowpass-shaping filter may be  
64    programmable with scalability for transmitting UWB data  
65    rates.

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67           12.   The digital FIR lowpass-shaping filter of claim  
68    11 wherein the outdoor handheld UWB transceiver may  
69    transmit the UWB data onto the selected channel to avoid  
70    the interference with WLAN 802.11a by using said digital  
71    FIR lowpass-shaping filter.

72

73           13.   A digital cascaded FIR filter for outdoor  
74    handheld UWB transmitter comprising:

75                a digital multiband FIR lowpass-shaping filter  
76    that is generated by a digital enlarged FIR lowpass shaping  
77    filter with inserting one zero into the between of two  
78    filter coefficients; and

79                   a digital rejected FIR lowpass filter.

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81           14. The digital cascaded FIR filter of claim 13  
82 wherein said digital enlarged FIR lowpass-shaping filter  
83 comprising:

84                   a lowpass band 0 - 0.512 (GHz);  
85                   a first transition band 0.512 - 0.65 (GHz);  
86                   a second transition band 0.65 - 0.78 (GHz);  
87                   a third transition band 0.78 - 0.9 (GHz); and  
88                   a stop band 0.9 - 1.0 (GHz).

89

90           15. The digital cascaded FIR filter of claim 14  
91 wherein said digital enlarged FIR lowpass-shaping filter  
92 has 51 filter taps with odd symmetric and linear phase.

93

94           16. The digital cascaded FIR filter of claim 13  
95 wherein said digital rejected FIR lowpass filter has  
96 frequency bandwidths comprising:

97                   a lowpass band 0 - 0.28 (GHz);  
98                   a transition band 0.28 - 0.7 (GHz); and  
99                   a stop band 0.7 - 1.0 (GHz).

100

101           17. The digital cascaded FIR filter of claim 16  
102 wherein said digital rejected FIR lowpass filter has 4  
103 filter taps with even symmetric and linear phase.

104

105           18. The digital cascaded FIR filter of claim 13  
106 wherein said digital cascaded FIR filter may be  
107 programmable with scalability for transmitting UWB data  
108 rates.

109

110           19. The digital cascaded FIR filter of claim 18  
111 wherein the outdoor handheld UWB transceiver may transmit  
112 the UWB data onto the selected channel to avoid the  
113 interference with WLAN 802.11a by using said digital  
114 cascaded FIR filter.